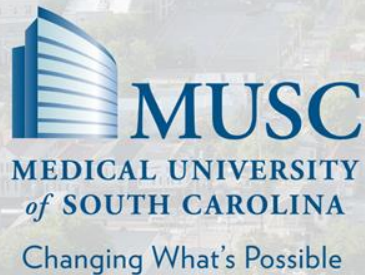


MUSC Energy Resilience Operating 24-7



Energy Resilience – MUSC

Business Continuity

Fire
IT Outage
Sewer Outage

Flooding – Internal
Phone Outage
Water Outage

HVAC Outage
Power Outage/Surge

Emergency Management - Natural Disaster

Earthquake
Flooding – Internal

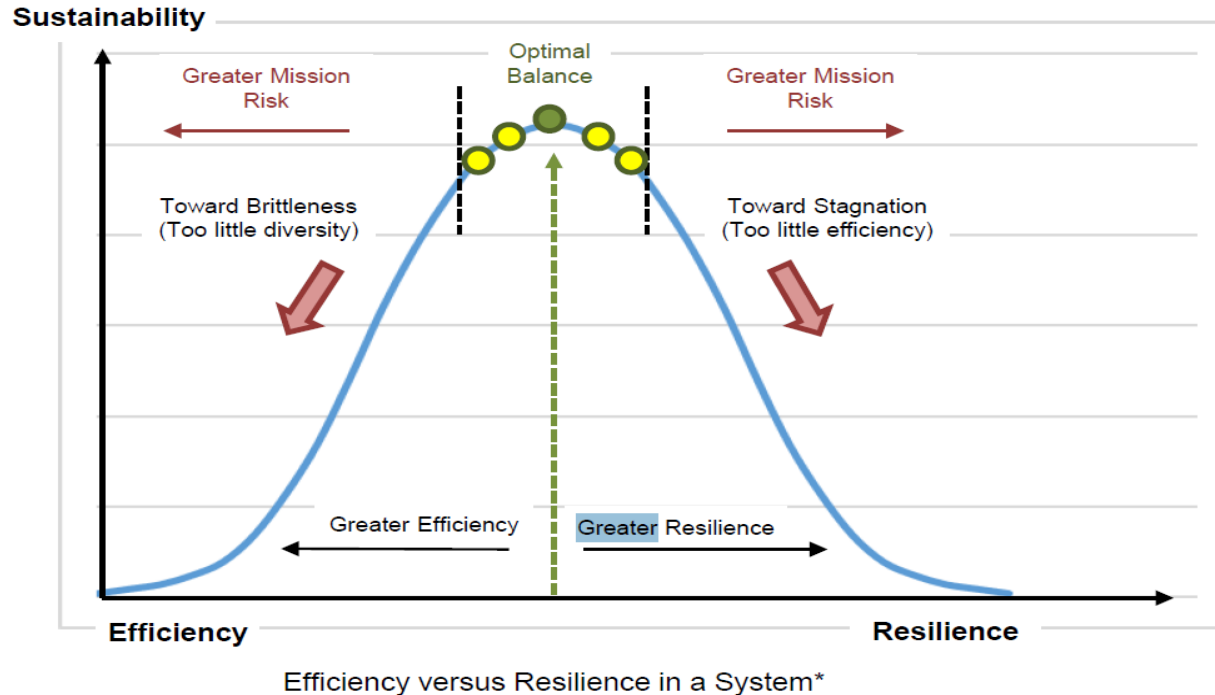
Fire
Hurricane

Flooding – External
Winter Weather

Energy Resilience - Department of Defense

Newly defined in 10 U.S.C §101, “Energy Resilience” is...

“...the ability to avoid, prepare for, minimize, adapt to, and recover from anticipated and unanticipated energy disruptions in order to ensure energy availability and reliability sufficient to provide for mission assurance and readiness, including task critical assets and other mission essential operations related to readiness, and to execute or rapidly reestablish mission essential requirements.”



Resilience on DoD Installations:

- (a) Balances flexibility, reliability, and resistance (**Resilience**) with honest acknowledgement of resource constraints (**Efficiency**)
- (b) Keeps a clear focus on the single most important metric:
Effectiveness

Energy Management - Reduce Demand (BC)

- › Certified Energy Manager
- › Track usage
- › Reduce usage
 - › Performance Contract
 - › 2009 \$2.50 M/Yr savings
 - › 2019 \$2.86 M/Yr savings
 - › Individual energy savings projects
 - › Utility rebates
- › Food truck power hook-ups



Energy Management - Reduce Demand (BC)

- › MEP standards
- › Renewables
 - › Back-up power source
- › CHP - IGA in progress
 - › Back-up to the grid
 - › 40-60% more efficient uses waste heat
- › Green purchasing standards (Energy Star & UL)



- › Green Building
 - › LEED Gold Bioengineering Building
 - › LEED Silver Sean Jenkins Children's Hospital



Energy Management – Reduce Demand (BC)

- › Transportation -12,000 daily commuters
 - › Walking
 - › Biking
 - › Riding CARTA EXPRESS bus (900+ day)
 - › Cancel for CARTA
 - › Riding a Motorcycle
 - › Carpooling
 - › LowGo – Free Emergency Ride Home
 - › Occasional Parker - \$5 day pass
 - › Carpooling to conferences/training
 - › Learning on-line and attending webinars
 - › Telecommuting instead of traveling
 - › Videoconferencing with colleagues
 - › Practicing Telemedicine
 - › Work from home policy



Energy Management – Education (BC)

Summer Energy Tips



TURN OFF COMPUTERS, PRINTERS, MONITORS, AND OTHER DEVICES OVERNIGHT AND ON WEEKENDS



TURN OFF THE LIGHTS WHEN NOT IN USE



DURING THE SUMMER MONTHS, SET YOUR THERMOSTAT TO A NORMAL 74° F



UNPLUG APPLIANCES WHEN NOT IN USE TO AVOID PHANTOM ENERGY CONSUMPTION

GoGreen
Lights Out Campaign

MUSC.EDU/GOGREEN

RECYCLE@MUSC.EDU

Please Turn Off
Lights & Projector
When Leaving
This Room



Please join members of the MUSC
Community in saving energy by
turning off before you leave

-MUSC Sustainability



muscedu/gogreen



Turn Off Before You Leave

Use
This
Checklist

- ❄ Overhead Lights
- ❄ Lamps
- ❄ Computers*
- ❄ Power Strips
- ❄ Printers/Copiers
- ❄ Coffee Pots
- ❄ Microwave
- ❄ Equipment
- ❄ Radio/Stereo
- ❄ Small Electronics
- ❄ Space Heaters

*Updates will occur when you power back up

Questions? recycle@muscedu

muscedu/gogreen



Changing What's Possible | MUSC.edu



Energy Management - Reduce Risks (BC)

- › Preventive Maintenance
 - › 30-35 K PM's year
 - › 100% completion rate for Hosp comply with JC
 - › 90% completion rate for Univ
 - › Mechanical
 - › Electrical
 - › Plumbing
 - › Building envelope
 - › Schedule routine outages
- › Dominion Energy Projects
 - › Steel power poles withstand 200 mph winds
 - › Extra transformer in on-campus sub-station in case one of 3 fail
 - › Rebuild transmission lines
 - › Move power underground where possible
 - › Curtailment (Winter)
- › (take picture of pole by PG 2)

Energy Resilience – MUSC

Business Continuity

Fire
IT Outage
Sewer Outage

Flooding – Internal
Phone Outage
Water Outage

HVAC Outage
Power Outage/Surge

Natural Disaster – Emergency Management

Earthquake
Flooding – Internal

Fire
Hurricane

Flooding – External
Winter Weather

Energy Management - Emergency Management

Mission:

Increase our resilience against emergency and disaster situations having the potential to adversely affect the MUSC community.

Cannot be accomplished alone

Goal:

Provide a means to utilize all available resources to:

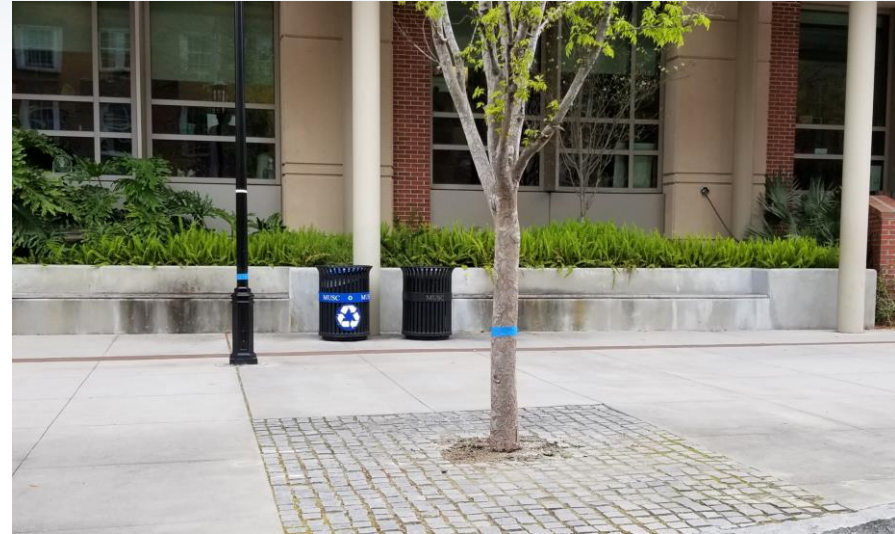
*Mitigate
Prepare
Respond
Recover
Continue*

Current Risks

Flood: Highest Tides Recorded in Charleston

(Mean Lower Low Water)

- 1) 12.52 ft 9/22/1989
- 2) 10.23 ft 8/11/1940
- 3) 9.92 ft 9/11/2017***
- 4) 9.29 ft 10/08/2016***
- 5) 8.81 ft 1/01/1987
- 6) 8.76 ft 11/24/2018 ***
- 7) 8.69 ft 10/27/2015***
- 8) 8.64 ft 5/28/1934



Current Risks

Flood (Rain, Sea Level Rise and Storm Surge)



Current Risks

Flood (Storm Surge Video)

<https://twitter.com/twitter/statuses/907317893695721473>

Irma footage



(Photo/Jared Bramblett)

Current Risks - Respond - Access



Current Risks Snow/Ice



Energy Management - Install Critical Systems above the Flood Line (EM)



FEMA

Mitigation Best Practices

Medical University Earns High Marks for Low Country Lesson in Disaster Resistance

Charleston, SC: The City of Charleston is known for its genteel beauty, conveying images of horse-drawn carriages strolling along cobblestone streets, ancient oak trees clothed in evergreen Spanish moss, and corridors of antebellum homes with open-air porches all shielded by a sea wall, appropriately called The Battery.

While these images are of ease, cordiality and relative safety are what typically come to mind when thinking of Charleston, one must also consider the reality of the low-lying city's vulnerability to flooding. To this end, residents, business owners and community leaders are always looking for ways to mitigate that risk. The Medical University of South Carolina's (MUSC) Department of Risk Management is doing just that by building and implementing a Disaster-Resistant University Plan, funded by a \$75,000 Pre-Disaster Mitigation Grant (PDM) from the Federal Emergency Management Agency (FEMA). PDM grants are administered by the state and provide funding to implement hazard mitigation planning activities prior to a disaster.

The MUSC plan takes into account vulnerabilities and strives to keep the campus community safe from the negative impact of hazards, particularly flooding. "It's looking at buildings on campus and ways to mitigate any areas for improvement," commented Jennifer Taylor, Assistant Director for Risk Management. "It's a way of figuring out what a building might need. It goes building-by-building and we essentially look at these buildings' weaknesses."

While evaluating their buildings and critical infrastructure, MUSC's Risk Management team made an important discovery – the hospital's generators, which supply the power for the entire campus, were 13 feet below sea level and in the 100 year floodplain. The 100-year flood has a 1% chance (1 in 100) of being equaled or



Photo courtesy of Medical University of South Carolina

MUSC's new power plant upon completion

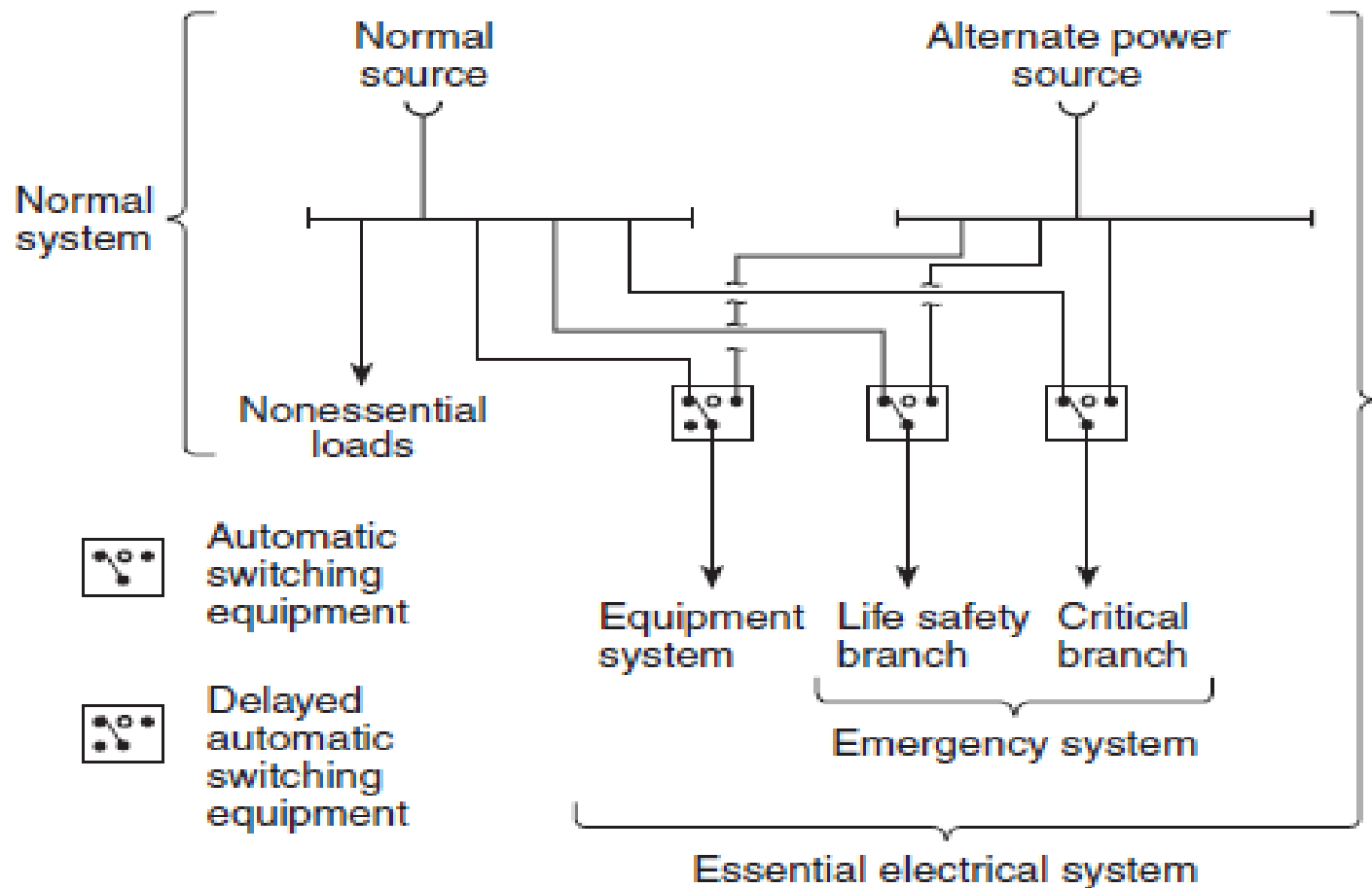


Energy Management - Eliminate Risks (EM)

- › On and off-site command centers
- › A & B staffing levels (essential)
- › C staffing level (non-essential)
- › Education for staff
- › Activate additional supplies
- › Communicate frequently
- › Close university
- › Close outpatient ops
- › Close research labs
 - › Wrap up all bench work
 - › Accommodate only critical items
- › Encourage students and non-essential staff to evacuate
- › Evacuate in-patients
- › Elevate or evacuate equipment
- › Prevent elevators from going to first/ground floor



Energy Management – Education (EM)



Energy Management - Back-up Power (EM)

- › Generators (47 generators, with 20 being JC)
 - › All sized larger than need
 - › Test monthly 30 mins load
 - › Test tri-annually (every 36 mos) 4hr load
- › Fuel Tanks
 - › Clean & check seals annually (contract)
 - › Clean & check seals after every hurricane (contract)
 - › Clean & check seals after nuisance flooding (in-house)
 - › Veeder Root tank detection systems (FRC)
- › Type of equipment on e-power
 - › Critical care equipment
 - › Lighting for egress & patient rooms
 - › Data center 100%
 - › Acute care & ICU's
 - › Operating and procedure rooms
 - › Pathology labs
 - › Research lab if it was designed that way
 - › Waste compactors
 - › Very little outside



Energy Management - Back-up Power (EM)

- › UPS backup for all critical systems
 - › Data centers
 - › Back-up data to the cloud
 - › Building Automation System
 - › Individual computers
 - › Research related equipment not already on e-power
 - › At department discretion



Energy Management - Back-up your Back-up (EM)

› Emergency Supplies

- › In ground fuel tanks 4 day supply (96 hrs for seismic zone 3A)
- › Two Fuel tankers 13,000 gal total, 3 day supply
- › Fuel companies on standby
- › Within 20 miles of fuel farm
- › 2 back-up generators
- › Fuel up all vehicles and equipment and elevate or evacuate
- › Extra cords
- › Flash lights
- › Batteries
- › Keys (takes place of electronic locks on doors and equipment ex. Pyxis & Accudose)

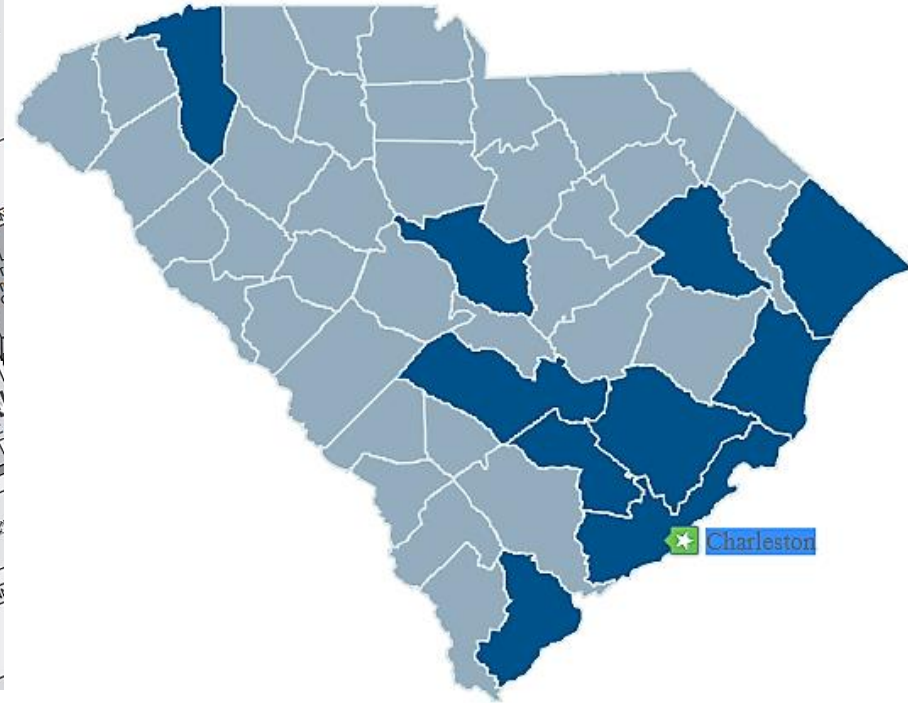
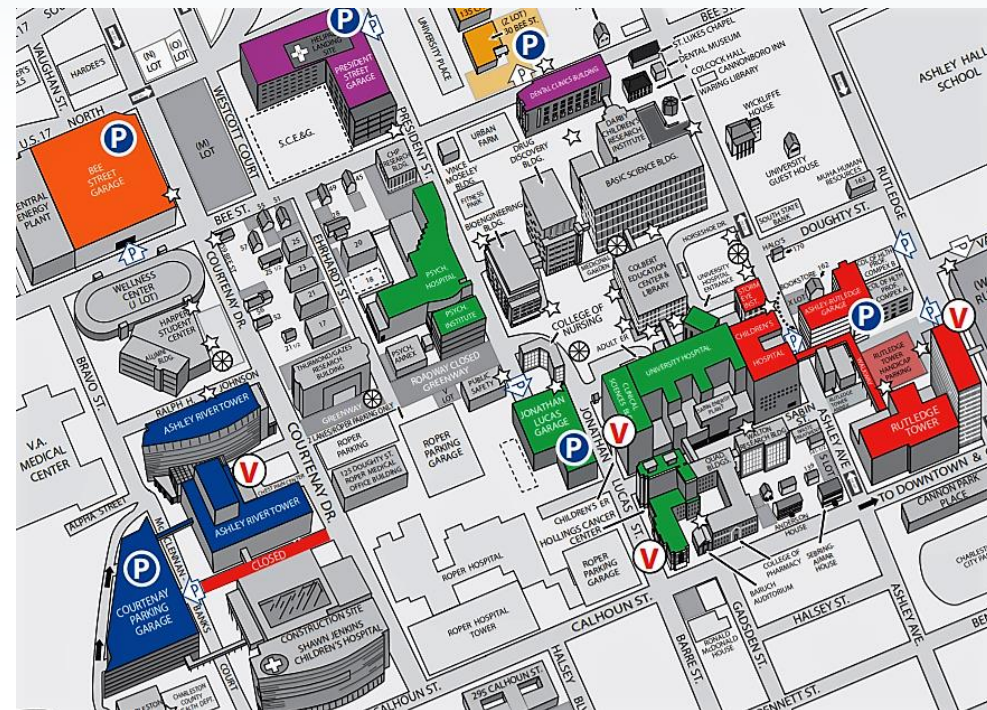
› Grounds

- › Fuel all vehicles and equipment and elevate
- › 50 gallons diesel
- › 60 gallons gas
- › Propane tanks
- › Oil
- › Manage tree trimming for electric lines



Emergency Preparedness

Mitigate – Infrastructure Expansion Outside of High Hazard Areas



Florence, Chester, Marion, Lancaster,
planning Berkeley

Emergency Preparedness

Prepare – Emergency Planning

Emergency Management Team –

Univ	Lt. Bryan Wood, Emergency Management Coordinator
MUHA	Kim Bailey, Emergency Management Coordinator
MUHA	Dr. Kathy Lehman-Huskamp, Pediatrics Emergency Medicine
Outpatient Clinics	Eric Modrzynski, Safety, Security and Emergency Programs

Emergency Support Functions ESF's

Public Safety
Communications
Risk Management
Engineering and Facilities
MUHA
Research

Leaders work closely with other colleges,
county, city, state, FEMA



Hospital Emergency Ops Center
(HEOC)

Emergency Preparedness

Prepare – Equipment on Hand



Emergency Preparedness

Prepare – Public Information Programs, Warning Systems

It is the responsibility of students, faculty and staff to seek guidance regarding all severe weather events via the following resources:

Turn off, elevate and/or cover up

MUSC ALERT:

- ☐ Personal Devices
- ☐ MUSC Email
- ☐ Desktop Alert
- ☐ Social Media: Facebook, Twitter

ALSO:

- ☐ MUSC Information Line: (843-792-MUSC) during any emergency event
- ☐ View the Red Ticker: MUSC homepage at www.musc.edu
- ☐ Listen: local radio and news channels

Emergency Preparedness

Recover – Temp Housing, Food, Damage Assessment, Reconstruction



Emergency Preparedness

Recover – Damage Assessment, Reconstruction



Engineering & Facilities

Matthew Costs: \$600,000 +

Irma Costs: \$700,000 +

Major Categories:

- Labor

- Equip/supplies

- Elevators

- Indoor clean up & water removal

- Fuel Oil and tank cleaning

- Sandbags

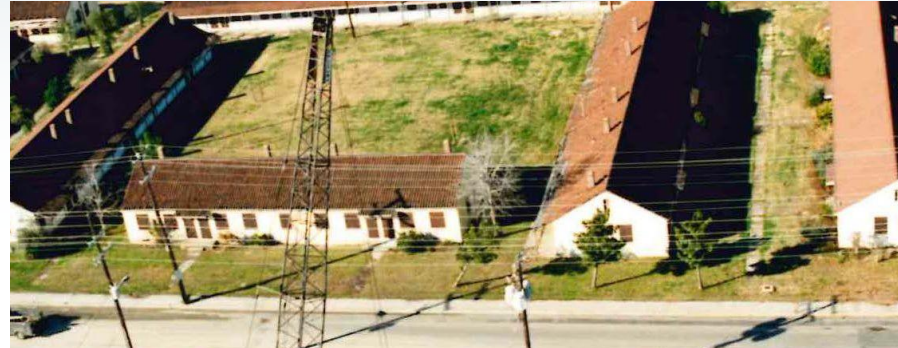
- Asbestos removal

- Standby water service

- Roof/ceiling/wall repairs

Emergency Preparedness

Continue – Flood Management, Partnership with City of Charleston



Emergency Preparedness Continue – Flood Management, Elevate Utilities



If All Else Fails



Thank You

